User perspective on the Human Connectome Project (HCP) MEG data

Tzvetan Popov, University of Konstanz

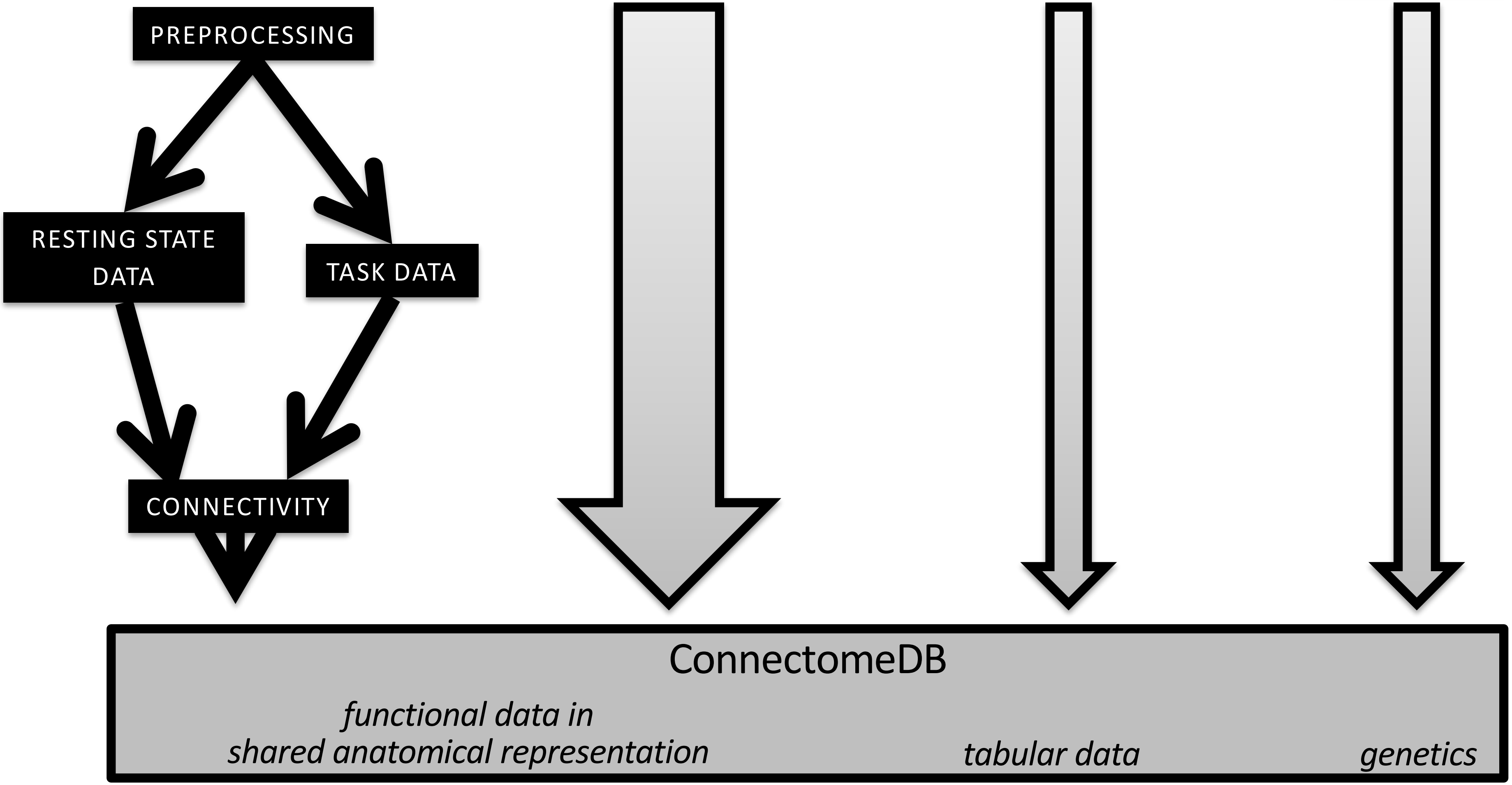
Who is HCP?

All subjects that participated

David van Essen and ~100 researchers in the WU-Minn HCP consortium

Human Connectome Project

- 2010: start of project
- 2012: start of data acquisition in St Louis
- 2015: complete 100 subject MEG release
- *2015: first outreach workshop Honolulu*
- *2016: second workshop Boston*
- 2017: complete 1200 subject MRI release
- *2017: third workshop Vancouver*
- *2018: fourth workshop Oxford*
- *2019: t.b.a.*



PREPROCESSING

RESTING STATE DATA

TASK DATA

CONNECTIVITY

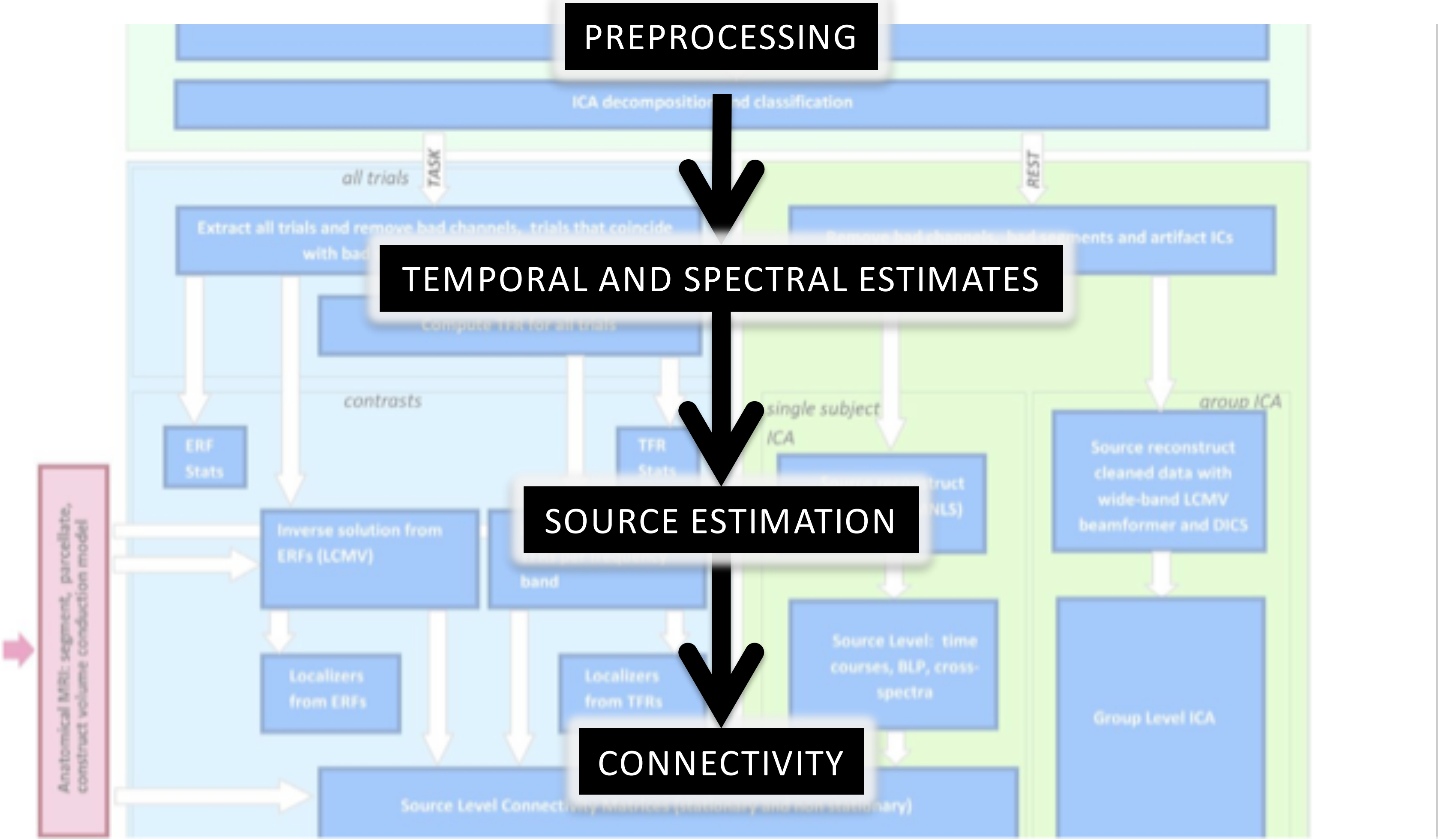
ConnectomeDB

functional data in shared anatomical representation

tabular data

genetics

Overview of MEG analysis


ICA decomposition and classification
all trials
TASK
REST
contrasts
ERF Stats
TFR Stats
single subject ICA
group ICA
Inverse solution from ERFs (LCMV)
band
Localizers from ERFs
Localizers from TFRs
Source reconstruct cleaned data with wide-band LCMV beamformer and DICS
Source Level: time courses, BLP, cross-spectra
Group Level ICA
Anatomical MRI: segment, parcellate, construct volume conduction model

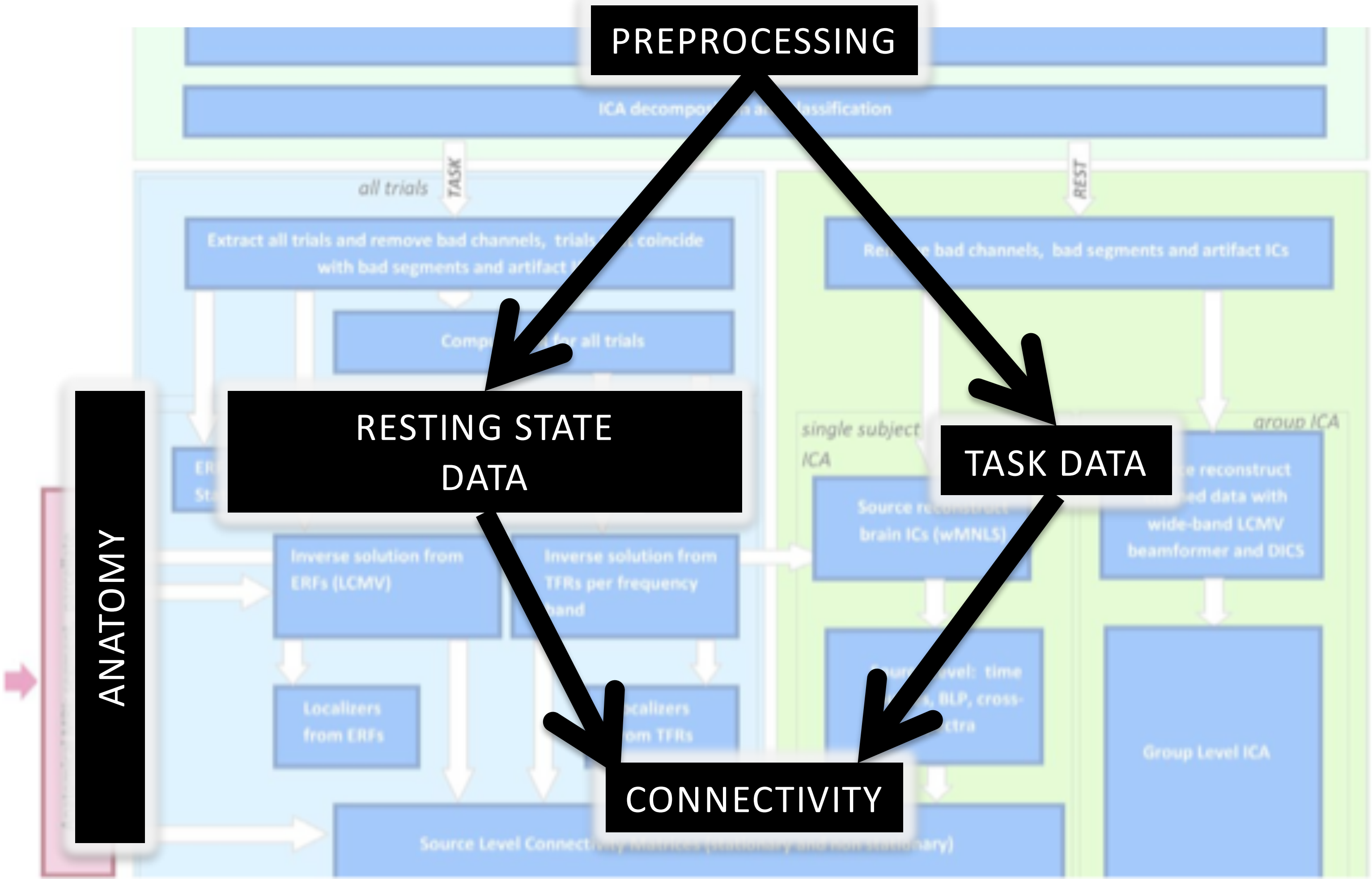
PREPROCESSING

TEMPORAL AND SPECTRAL ESTIMATES

SOURCE ESTIMATION

CONNECTIVITY

Overview of MEG analysis



PREPROCESSING

RESTING STATE DATA

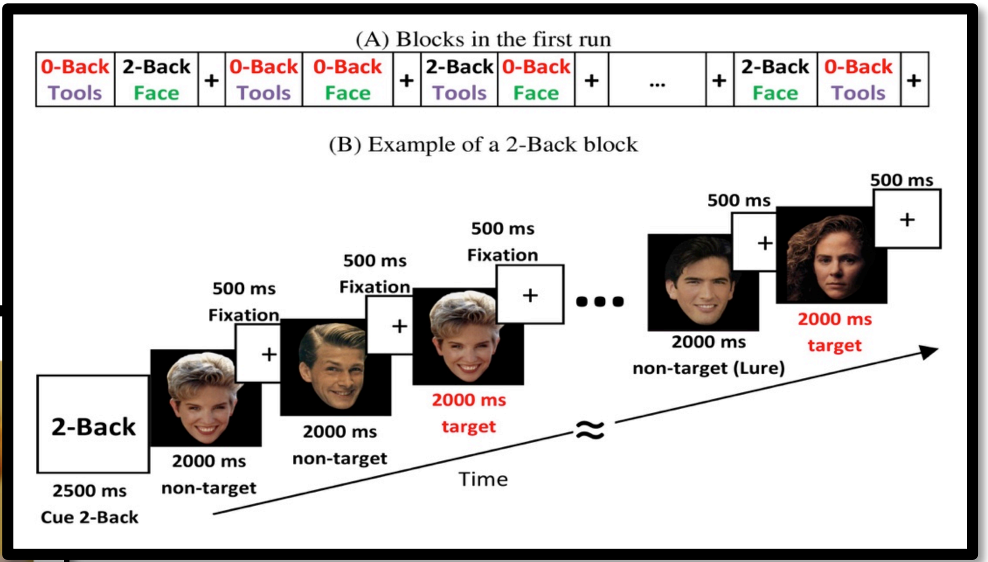
TASK DATA

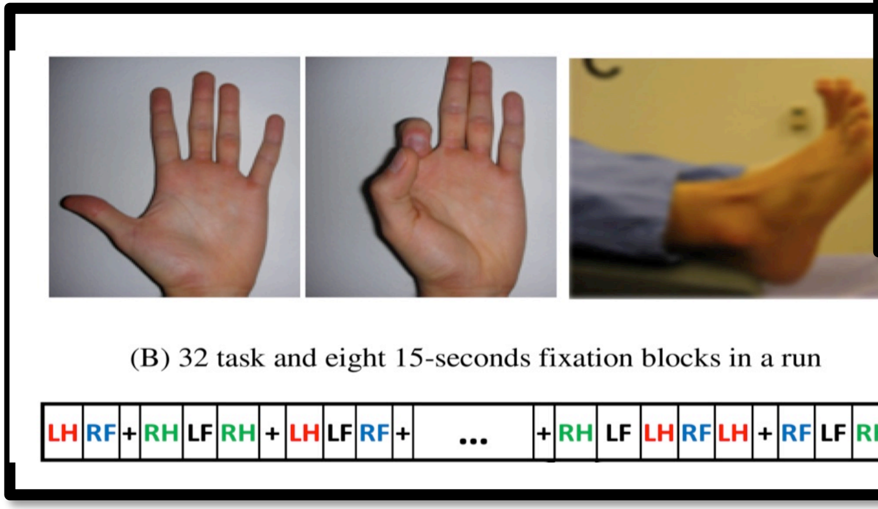
CONNECTIVITY

ANATOMY

Paradigms with MEG – subset of fMRI tasks

- 3x 5 mins Resting state
- 0 and 2-back Working Memory task
- Story/Math task
- Motor task (with EM

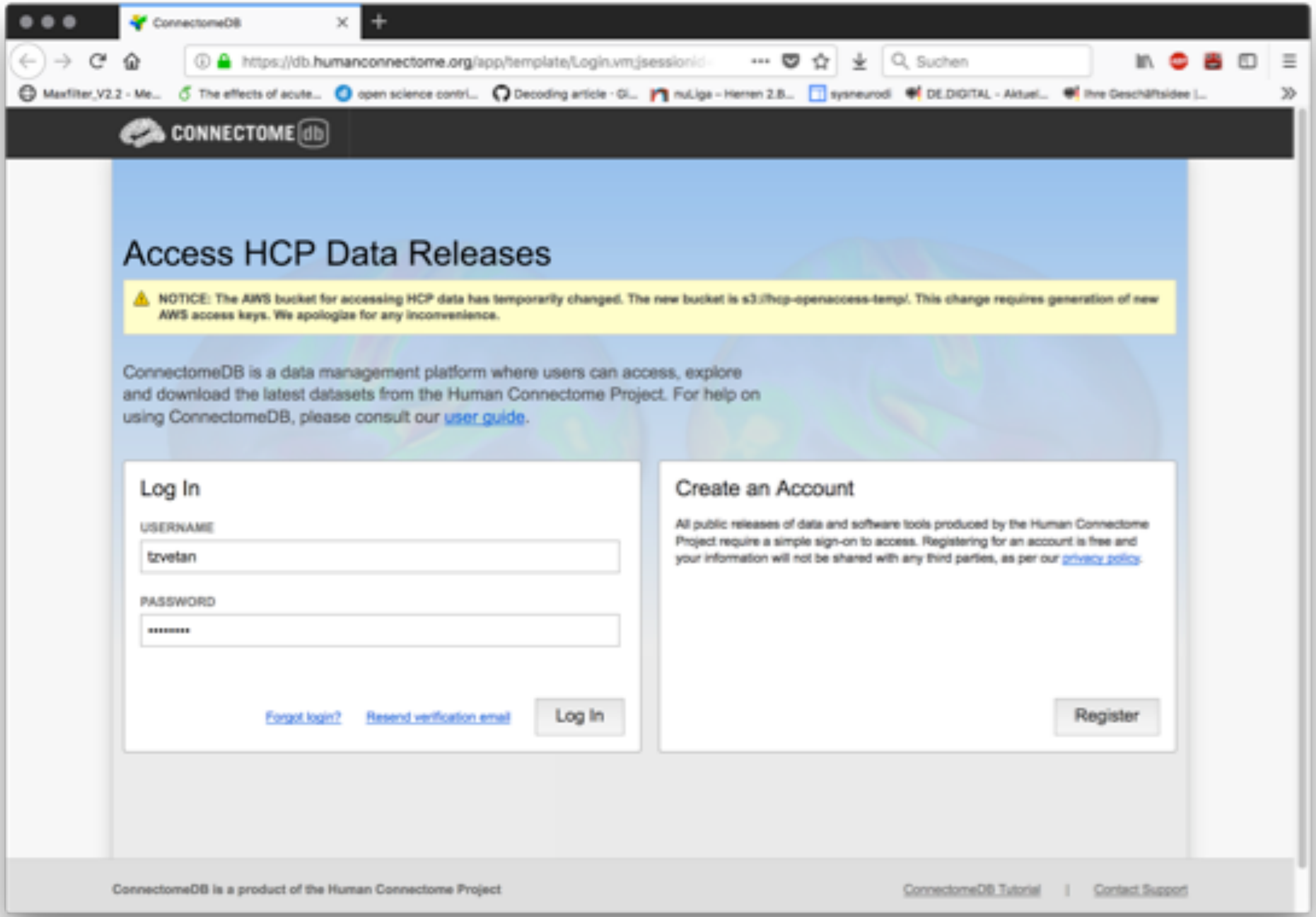




(B) 32 task and eight 15-seconds fixation blocks in a run

LH RF + RH LF RH + LH LF RF + ... + RH LF LH RF LH + RF LF RH +

Data access- fast, of the shelf



Access HCP Data Releases

NOTICE: The AWS bucket for accessing HCP data has temporarily changed. The new bucket is s3://hcp-openaccess-temp/. This change requires generation of new AWS access keys. We apologize for any inconvenience.

ConnectomeDB is a data management platform where users can access, explore and download the latest datasets from the Human Connectome Project. For help on using ConnectomeDB, please consult our user guide.

Log In

USERNAME: tzvetan

PASSWORD: ••••••••••

Forgot login? Resend verification email

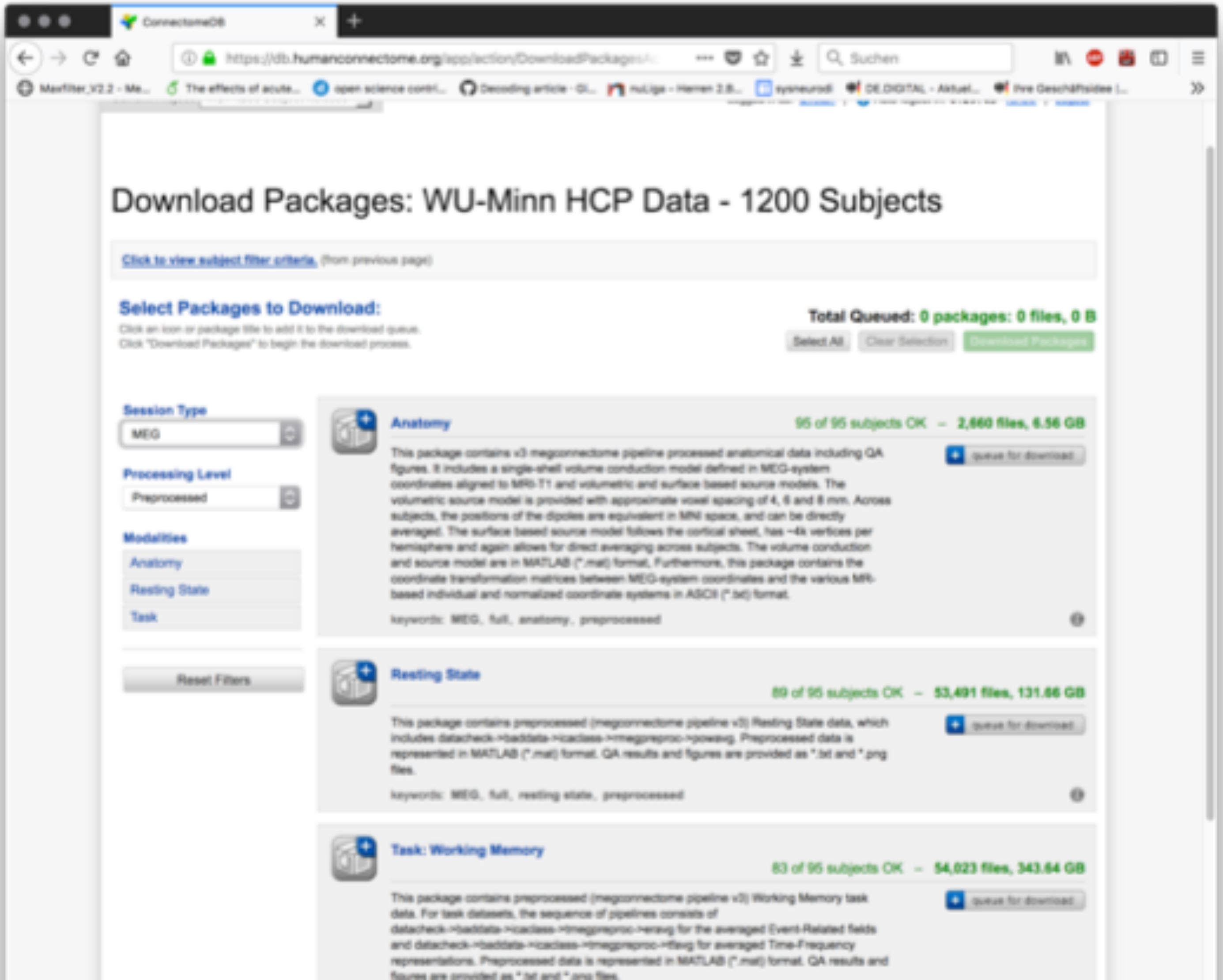
Create an Account

All public releases of data and software tools produced by the Human Connectome Project require a simple sign-on to access. Registering for an account is free and your information will not be shared with any third parties, as per our privacy policy.

ConnectomeDB is a product of the Human Connectome Project

ConnectomeDB Tutorial | Contact Support

Various download options


ConnectomeDB
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Suchen

Download Packages: WU-Minn HCP Data - 1200 Subjects

Click to view subject filter criteria. (from previous page)

Select Packages to Download:

Click an icon or package title to add it to the download queue.
Click "Download Packages" to begin the download process.

Total Queued: 0 packages: 0 files, 0 B

Select All
Clear Selection
Download Packages

Session Type: MEG

Processing Level: Preprocessed

Modalities
- Anatomy
- Resting State
- Task

Anatomy 95 of 95 subjects OK – **2,660 files, 6.56 GB**

This package contains v3 megconnectome pipeline processed anatomical data including QA figures. It includes a single-shell volume conduction model defined in MEG-system coordinates aligned to MRI-T1 and volumetric and surface based source models. The volumetric source model is provided with approximate voxel spacing of 4, 6 and 8 mm. Across subjects, the positions of the dipoles are equivalent in MNI space, and can be directly averaged. The surface based source model follows the cortical sheet, has ~4k vertices per hemisphere and again allows for direct averaging across subjects. The volume conduction and source model are in MATLAB (*.mat) format. Furthermore, this package contains the coordinate transformation matrices between MEG-system coordinates and the various MR-based individual and normalized coordinate systems in ASCII (*.txt) format.

keywords: MEG, full, anatomy, preprocessed

Resting State 89 of 95 subjects OK – **53,491 files, 131.66 GB**

This package contains preprocessed (megconnectome pipeline v3) Resting State data, which includes datacheck->baddata->icaclass->megpreproc->powavg. Preprocessed data is represented in MATLAB (*.mat) format. QA results and figures are provided as *.txt and *.png files.

keywords: MEG, full, resting state, preprocessed

Task: Working Memory 83 of 95 subjects OK – **54,023 files, 343.64 GB**

This package contains preprocessed (megconnectome pipeline v3) Working Memory task data. For task datasets, the sequence of pipelines consists of datacheck->baddata->icaclass->tmegpreproc->eravg for the averaged Event-Related fields and datacheck->baddata->icaclass->tmegpreproc->tfavg for averaged Time-Frequency representations. Preprocessed data is represented in MATLAB (*.mat) format. QA results and figures are provided as *.txt and *.png files.

Alpha and gamma power change with WM load

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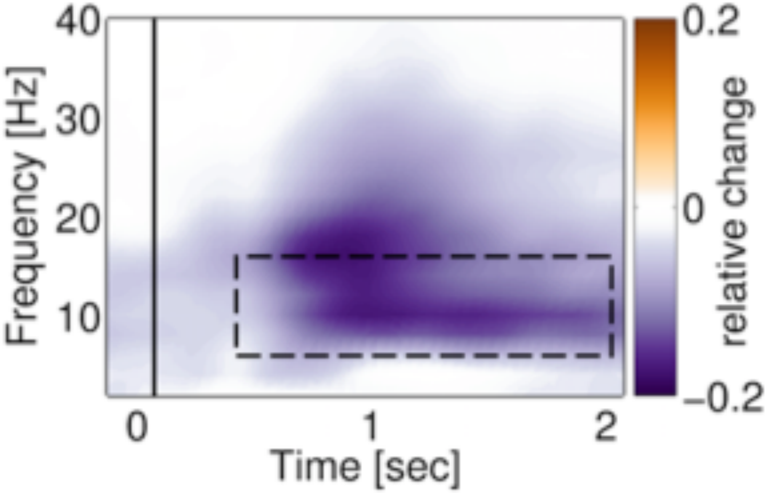

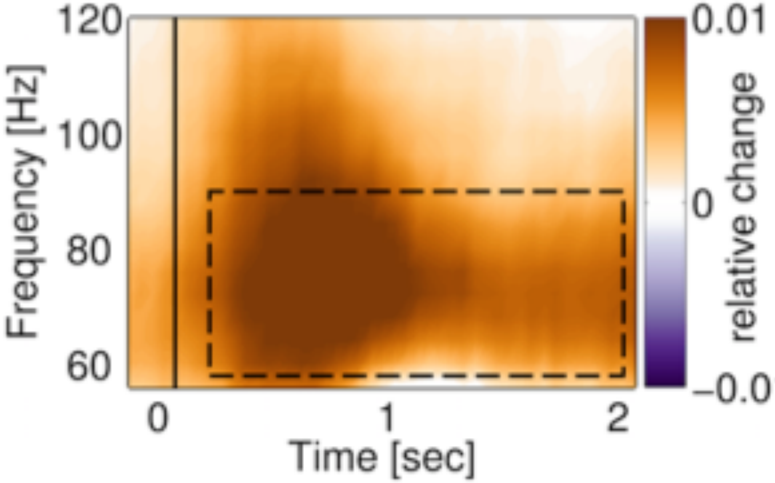

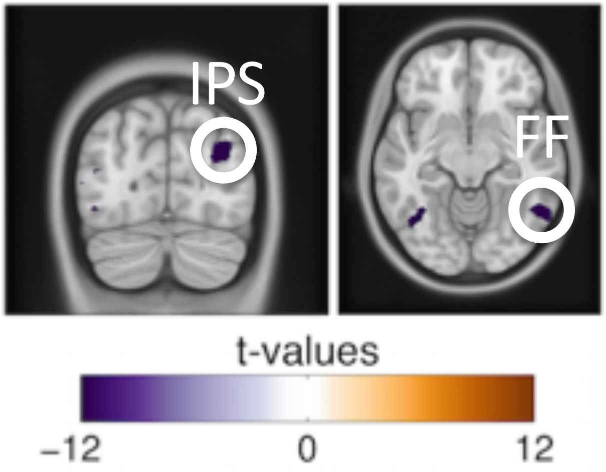

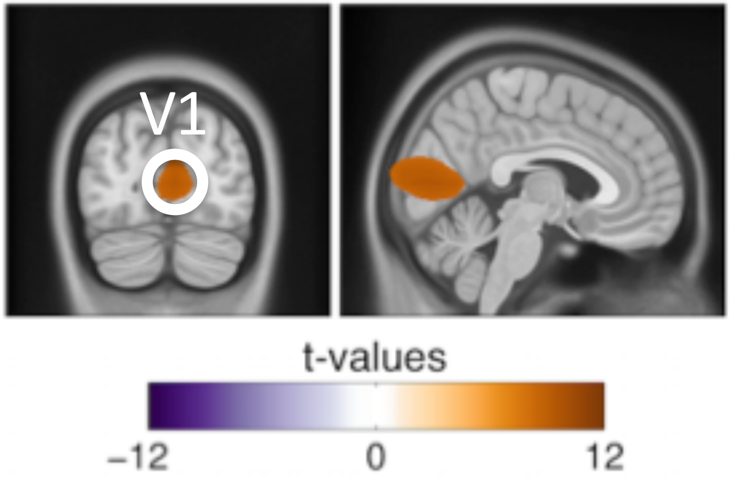

Popov et al., 2018, NeuroImage

IPS alpha power predicts V1 gamma power on a trial-by-trial basis

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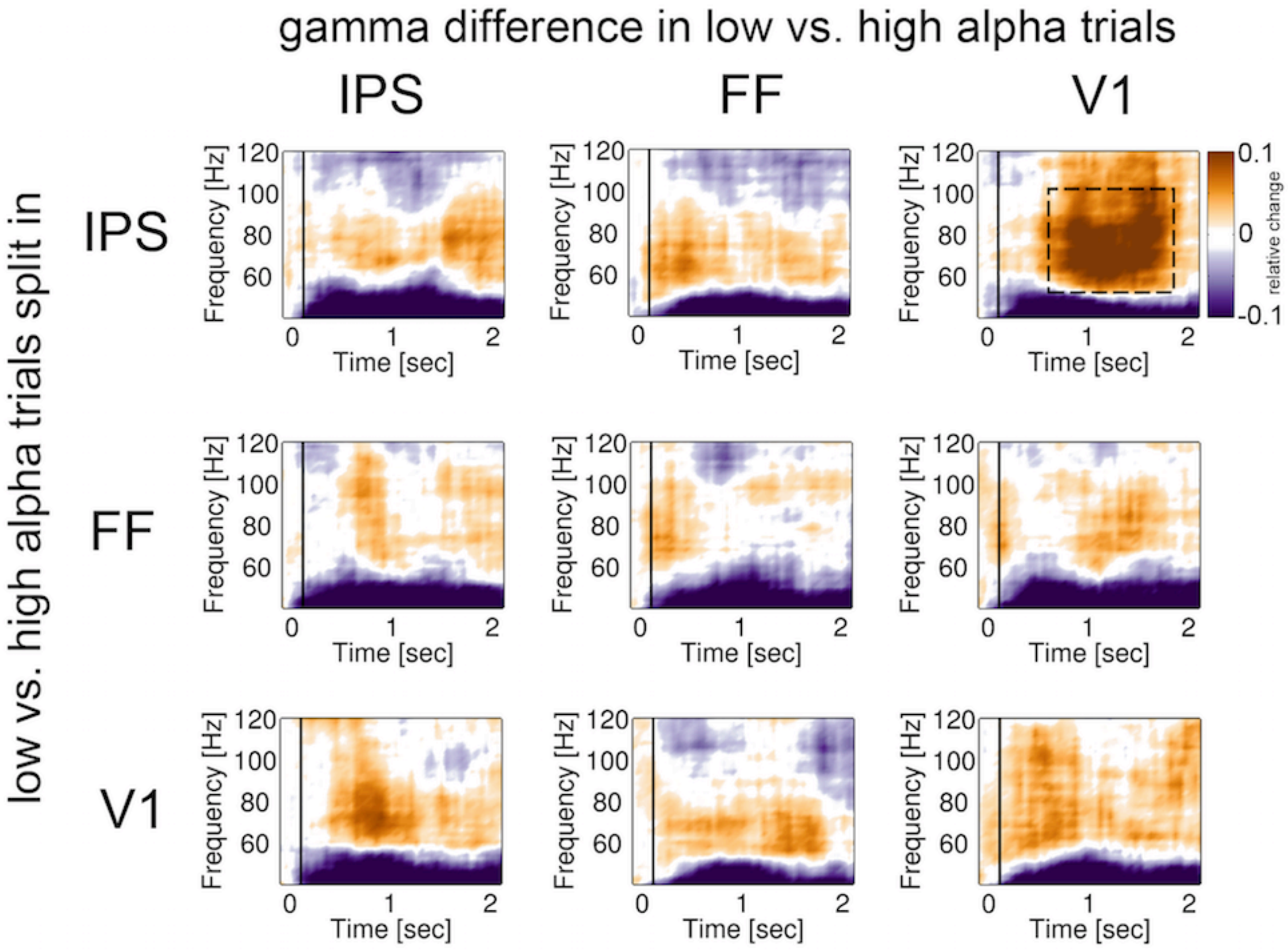

Popov et al., 2018, NeuroImage

Dorsal cortex exerts top-down control over visual and ventral areas at 10 Hz

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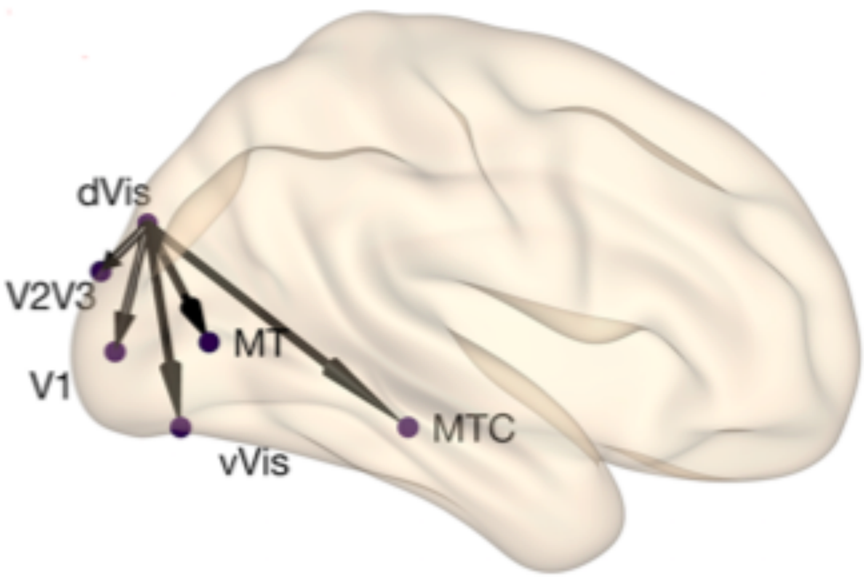
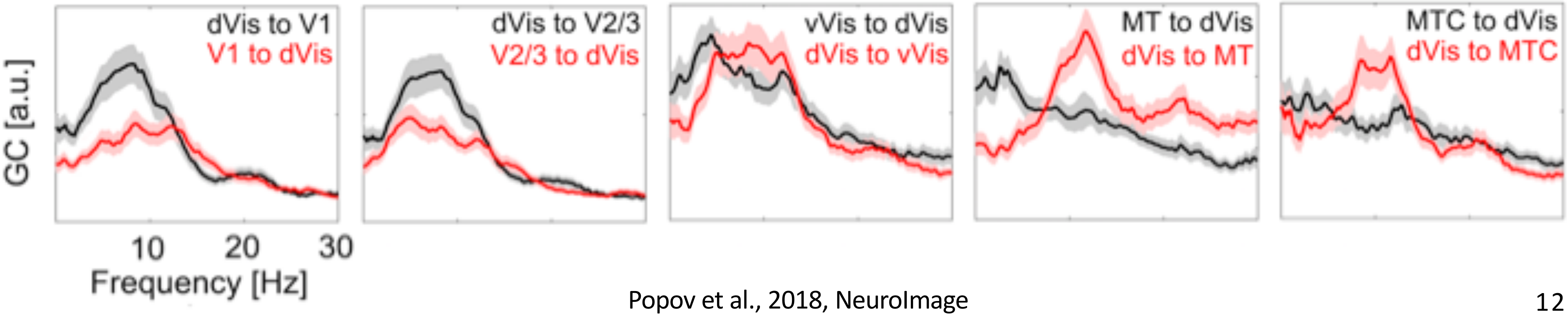


No GC effects in gamma found!

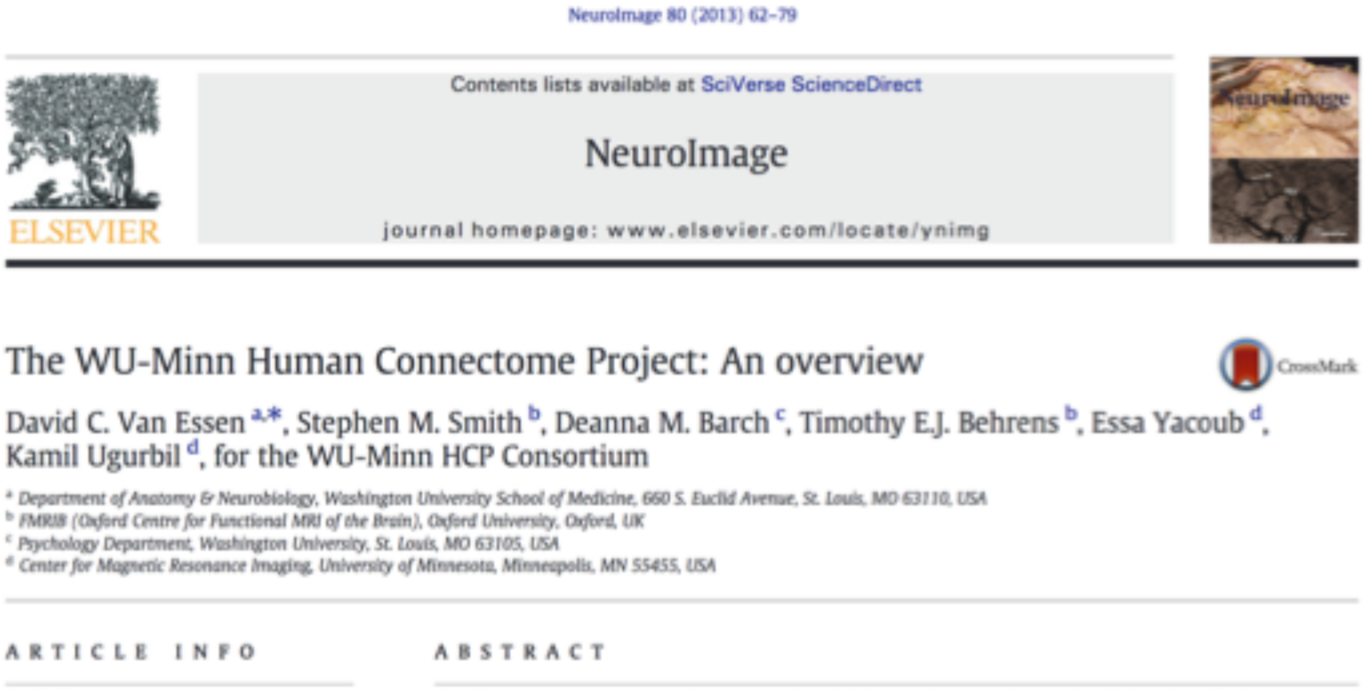


Popov et al., 2018, NeuroImage

Using the HCP data in the context of WM task:

- Spatially specific power-power correlations between alpha and gamma activity during WM
- Ventral regions are under top-down control from dorsal regions

- Do these findings generalize to other tasks too?
- What is the relationship to hemodynamic responses?
- The HCP initiative provides a framework to address these open issues?



NeuroImage 80 (2013) 62–79

Contents lists available at SciVerse ScienceDirect

NeuroImage

journal homepage: www.elsevier.com/locate/ynimg

The WU-Minn Human Connectome Project: An overview

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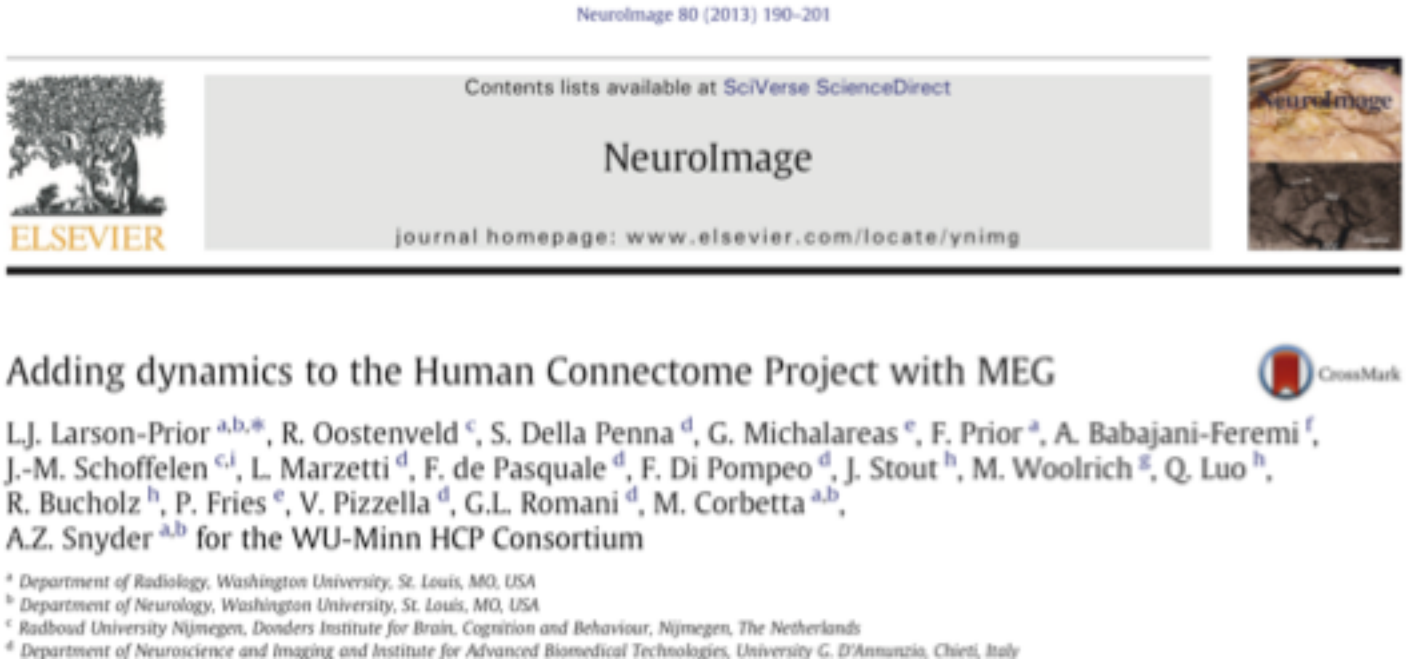
ARTICLE INFO

ABSTRACT



NeuroImage 80 (2013) 190–201

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Adding dynamics to the Human Connectome Project with MEG

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Thank You

The HCP MEG team
Linda Larson-Prior
Robert Oostenveld
Jan-Mathijs Schoffelen
Francesco de Pompeo
Giorgios Michalareas
Abbas Babajani-Feremi
Stefania Dela Penna
Vittorio Pizzella
Francesco di Pasquale
and others

FieldTrip

Ole Jensen
University of Birmingham

Netherlands Organisation for Scientific Research